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256–544–0030
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The Marshall Star is published every Wednesday by the Public and Employee Communications Office at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. The Star does not publish commercial advertising of any kind.

Manager of Public and Employee Communications: Dom Amatore
Editor: Jenalane Rowe

NASA Initiates Critical J-2X Rocket Engine Test Series

By Megan Davidson

A 60-second test fire of NASA's new J-2X rocket engine June 14 kicked off a series of six scheduled tests under simulated flight conditions.

J-2X will power the upper stage of NASA's 130-metric-ton Space Launch System (SLS) -- a new heavy-lift rocket capable of missions beyond low-Earth orbit.

J-2X engine No. 10002 will remain on the A-1 test stand at NASA's

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J-2X engine No. 10002 is tested June 14 on the A-1 test stand at NASA's Stennis Space Center. The 60-second test signals the start of a series of firings to collect critical data on engine performance. (NASA/SSC)

Marshall's First Chief Knowledge Officer Discusses His New Role

By Molly Porter

We create and use knowledge in every aspect of work we do at NASA's Marshall Space Flight Center, but where do we go to find out what we don't know?

A knowledge-intensive organization like Marshall faces continuous challenges identifying, capturing and sharing what it knows. As solutions evolve, Marshall is committed to fostering a climate of continuous learning.

Enhancing our development as a learning organization means rethinking how knowledge works at Marshall. Historically, Marshall placed importance primarily on information systems and one-way training. The developing approach is more people-centered.

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Chief Knowledge Officer *Continued from page 1*

In a recent interview, Dale Thomas, associate center director, technical, shed some light on knowledge activities here at Marshall and his role as Marshall's first chief knowledge officer.

How would you describe the state of knowledge here at the center?

When I was hired in the early '80s, in the first few years what you did to learn was find where the various pockets of knowledge were. When you ran into a problem, you'd look to your team lead or your branch chief who would tell you, "Go talk to so and so." And you'd walk over and talk to that person until eventually you found access to the knowledge you needed to solve your problem. But today's generation wants that knowledge at their fingertips. This isn't about right and wrong. It's about being raised in a digitally connected environment. These are just different expectations, and if we ignore them, we imperil our future.

How will the center respond to the changing expectations?

The short answer is we don't know yet, but we're working on it. We're learning. It's like most other challenging problems. Marshall loves a challenge. Solving challenging problems is what we do here.

How do you see your role as Marshall's chief knowledge officer?

Well, chief knowledge officer is just one of several hats I wear, but there's a knowledge/strategy component that goes through everything I do in this position.

The center already does a lot that falls into the family of knowledge management. The Launch and Space Systems e-Library, or LaSSe, that has been developed and run out of the Engineering Directorate for several years, is a textbook example of knowledge capture. The Space Launch and Transportation System, or SLaTS, course that Marshall veterans Jim Blair, Bob Ryan and Luke Schutzenhofer teach through the Office of Human Capital is an excellent example of successful knowledge sharing.

Dr. L. Dale Thomas, Associate Director, Technical, Marshall Space Flight Center. (NASA/MSFC)

It's important to note that our knowledge management efforts also reach beyond the center and across all of Marshall's unique technical capabilities and areas of expertise. NASA Engineering and Safety Center Director Ralph Roe visited Marshall earlier this month to discuss lessons learned from the loss of the space shuttle Columbia. Recently, the National Space Science and Technology Center (NSSTC) held a distinguished lecture on results from NASA's Wide-field Infrared Survey Explorer (WISE) mission by Ned Wright, WISE principal investigator. The Technical Transfer Program (ZP30) is hosting a series of New Technology Roadshows on disclosing and protecting innovative technology. These are just a few examples.

The point I'm trying to make is that activities came together organically to fill a need here at the center. Together with the Lessons Learned team, we're pulling some coherence into these efforts. I want to stress, however, that it's a very low-budget operation, so we're pursuing affordable ways to leverage proven knowledge strategies here at Marshall.

It sounds like you might consider yourself, sort of, an advocate?

I'm very much an advocate for charting a path forward. What we're trying to do is harness the knowledge of yesterday and today in ways that are relevant and

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Marshall Center's Lessons Learned Team Stresses Knowledge Infusion

By Molly Porter

An oft-quoted line penned by George Santayana reads, "Those who cannot remember the past are condemned to repeat it." But what good is remembering the past if we fail to learn from it?

Over the past year, NASA's Marshall Space Flight Center's newly formed Lessons Learned Committee and the Distilling Team that supports it have been working to enhance Marshall's development as a learning organization.

"One of the big pieces of NASA Knowledge Management policy is lessons learned," explained Dale Thomas, associate center director, technical, who was also appointed Marshall's first chief knowledge officer last fall. "Programs and projects captured lessons in reports, but the lessons weren't really getting embedded in what we do."

The evolving process incorporates strategies for applying knowledge gained from the past to improve work practices. The Distilling Team is an important part of that.

"The key concept of the Distilling Team is infusion," Jennifer Stevens, Marshall systems engineer, made clear. "Infuse the lessons learned into the processes of today and tomorrow in a wise and well-considered manner so that we make all new kinds of mistakes rather than repeating the same ones over and over again."

Stevens serves as one of two lessons learned representatives who help Marshall employees, teams and projects learn how to gather, document and share lessons learned. Their ultimate goal is to make sure the center has the knowledge needed to complete successful projects and help NASA achieve its vision.

"It's energizing to be working toward improving what we are doing, even if it is in small ways," said Stevens. "It is through small changes that great things can come to pass."

Lessons come from all aspects of work done at Marshall. These lessons might range from small but critical parts items to safety procedures, contract issues and physical or engineering discoveries.

Stevens sees a lot of passion in Marshall employees

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useful in a changing world so Marshall Center stays prepared to meet the challenges of tomorrow.

And how to do that, that's the big question, right?

As chief knowledge officer, my job is exactly that -- ask questions that shine a light in the right place.

How can we make everyone at Marshall part of the solution?

We are trying to do knowledge management here at the center largely organic rather than set up a large organization to run it. Its success depends on people taking initiative as opposed to waiting for a solution to be put in front of them.

So that's my charge -- get involved. Organizations and teams can do their own formal and informal knowledge sharing. Pause-n-learn activities can be relatively quick, productive ways for teams to reflect for improvement. We also encourage lunch-n-learns and brown bag lectures that help Marshall team members learn from experience. Sharing information about existing knowledge sources can help Marshall team members find what they need when they need it. Join the conversation about knowledge at Marshall.

Learn more about knowledge at Marshall at the MSFC Lessons Learned & Knowledge Gnosticonomy group page on ExplorNet.

Porter is a Pathways Intern in the Office of Strategic Analysis & Communications.

Marshall's 'Take Our Children to Work Day' to Mix Learning, Fun June 20

By Rick Smith

NASA's Marshall Space Flight Center will hold its annual "Take Our Children to Work Day" June 20, offering children in grades 3-12 a variety of hands-on learning activities, demonstrations and participatory events.

Marshall Center Deputy Director Teresa Vanhooser and NASA astronaut T.J. Creamer, a payload operations director in Marshall's Payload Operations Center, will welcome children in Morris Auditorium in Building 4200 at 8 a.m. Creamer also will be available to sign autographs from 9-10 a.m. in Activities Building 4316.

Marshall engineers and science teams will host a variety of events and activities from 8:30 a.m. to 2:30 p.m. in facilities across the Marshall campus, including the Flight Robotics Laboratory in Building 4619; the Propulsion Research & Development Laboratory in Building 4205; and buildings 4200 and 4316.

In the Flight Robotics Laboratory, children can explore the Marshall Center's acoustic test chamber and learn about powerful engine testing and other dynamic research conducted by Marshall engineers. They also can visit the laboratory's flat-floor facility -- the largest, flattest floor in the world: 44 feet wide, 86 feet long, and varying no more than a thousandth of an inch in height, allowing controllers to test techniques for spacecraft docking or remote-controlled robotics.

In the Activities Building and at other venues, children can take commemorative pictures of themselves with NASA's Space Launch System, Orion crew vehicle or the International Space Station; take part in hands-on science demonstrations about states of matter and the

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J-2X Test

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Stennis Space Center for all six tests. Engineers will evaluate the engine's gimbaling, or pivoting, to see that it moves to ensure the rocket will fly on its proper trajectory, just as it is designed to do during an actual flight. When the tests conclude later this summer, the engine will have been fired at full power and for the total time it would operate during an actual flight.

"This will be a thrilling test series," said Tom Byrd, J-2X engine lead in the SLS Liquid Engines Office at NASA's Marshall Space Flight Center. "We will see our engine parts flex as designed during gimballing. We also will collect much-needed data about loads that stress the engine as it gimbals." Loads tests mimic stresses, like pressure, that the engine may encounter during its mission.

"These are our only open-atmosphere tests," added Byrd, "which means J-2X will show its bright flame, intense heat and, of course, the incredible sound that makes rocket engine testing so exciting."

Data will be collected on engine performance throughout the test firings. Data also will be obtained on the performance of Stennis' A-1 test stand for future testing. Following gimbal testing, the stand will be outfitted for RS-25 engines -- the former space shuttle main engines -- which will be used to power the core stage of the SLS. RS-25 testing is scheduled to begin on the A-1 stand in 2014.

The SLS Program is managed at the Marshall Center.

Davidson, an Analytical Services Inc. employee, supports the Office of Strategic Analysis & Communications.

Albert Einstein Takes Research to Space Station; Marshall's Operations Team Supports Mission

By Jessica Eagan

You may be surprised to hear that Albert Einstein arrived June 15 at the International Space Station with 1,049 pounds of supplies, including equipment to keep science happening in the orbiting laboratory.

Although Einstein probably would have loved to work in a space laboratory that has an instrument studying dark matter, it is not the scientific genius who stopped by. Rather, it's the European Space Agency's unmanned Automated Transfer Vehicle (ATV) 4, named in honor of the 20th century theoretical physicist and icon of modern science. Science is the main reason for the visit, and that would likely have pleased the influential scientist.

NASA's Payload Operations Integration Center team members at the Marshall Space Flight Center joined in support of the ATV-4 arrival, whose journey began on an Ariane-5 rocket launched June 5 from Guiana Space Center near Kourou, French Guiana.

"Every time a resupply spacecraft brings new research to the space station, Marshall's operations team has to certify we are ready to operate the new payload hardware and software arriving," said Jimmy Whitaker, a payload operations director at Marshall. "Even though we are not in space, we have to know exactly what the crew will be doing during each investigation.

The European Space Agency's fourth Automated Transfer Vehicle launches atop an Ariane 5 rocket from Kourou, French Guiana. (ESA/S. Corvaja)

"Once the hatch is open, everything is in place, and we are ready to work with payload developers and investigators around the world as their experiments unfold in space," added Whitaker.

Some investigations aboard the ATV-4 include Energy, Capillary Flow Experiments-2 (CFE-2) and Dynamic Surf.

The Energy study measures changes in energy balance in crew members following long-term spaceflight. It measures adaptations in the components of total energy expenditure, helping researchers derive an

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Lessons Learned *Continued from page 3*

at a grass roots level. Branches and teams at all levels often develop their own ways to capture and share lessons. Some disciplines and teams use resources such as ExplorNet or LaSSe. Others experiment with new technology or assign mentors. Still others use "pause-and-learn" methods.

"Learning is natural," said Stevens. "The most effective infusion leverages off of what people already know how to do or know how to use."

The Lessons Learned team welcomes all forms of feedback that may help Marshall employees *learn better* from past experiences.

Marshall employees may also tap into work being done by the Lessons Learned team at the Distilling Team group page on ExplorNet or on the NASA Engineering Network.

Porter is a Pathways Intern in the Office of Strategic Analysis & Communications.

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equation to determine the energy requirements of crew members during spaceflight. This knowledge ensures health, good performance and the overall success of a mission by helping planners determine the proper amount of exercise and food that each crew member needs to be healthy and productive. Scientists use these techniques to assess energy expenditure of people on Earth and to plan space missions.

The suite of fluid physics experiments, known as CFE-2, study how fluids move "up" surfaces in microgravity. Results from prior experiments already have improved current computer models of low-gravity fluid systems. Spacecraft designers have incorporated information from the models to improve fluid transfer systems on future spacecraft. The experiment has applications for medical testing.

Dynamic Surf examines Marangoni convection, a flow driven by the presence of surface tension gradient as produced by a temperature difference at the liquid/gas interface. By understanding how these fluids move, scientists can learn how heat is transmitted in microgravity, and ultimately drive the design and development of more efficient fluid flow-based systems and devices. The knowledge from the Marangoni space experiment is applicable to the high-performance heat exchanger and heat pipe in space and on Earth. Designing more efficient, lightweight radiators that remove unwanted heat from spacecraft is critical for long-duration space missions.

"ATV-4 is vital to the science operations aboard the station because the work and activities the crew will perform vary with each mission," said Jorge Sotomayor, lead increment scientist for Expedition 35/36. "ATV's role in the International Space Station Research Program is to serve as a resupply spacecraft for station research. In that way, the resupply vessels open the door for more investigations to be conducted than ever before, helping us make amazing discoveries through station research."

To read more about the research that was delivered to the station and its benefits to life here on Earth, visit here. To learn more about space station science, visit here and here.

With all these cool studies going on above our heads, if Albert Einstein were alive today, his hair probably would be standing -- wilder and higher in amazement. He would likely be fascinated by these influential studies going on in a place where his theories have been and continue to be tested in the name of discovery.

Eagan, an Analytical Services Inc. employee, supports the Office of Strategic Analysis & Communications.

NASA, Partner Collaborate on Key Piece of Orion Flight Test Hardware

Technicians from Janicki Industries in Hamilton, Wash., work in collaboration with engineers from NASA's Langley Research Center and NASA's Marshall Space Flight Center to build part of the Space Launch System, NASA's next-generation launch vehicle. Above, they are working on a diaphragm for the Multipurpose Crew Vehicle Stage Adapter. Joint efforts between NASA and Janicki Industries enable engineers to verify proper functioning of this part of the SLS vehicle with the Orion spacecraft for its first mission -- Exploration Flight Test -1 (EFT-1) -- scheduled to launch in 2014. The adapter will attach Orion to the launching rocket, and the diaphragm will be used to keep launch vehicle gases away from the spacecraft. United Launch Alliance, which makes the Delta IV in nearby Decatur, Ala., will deliver a full-size section of the rocket to Marshall, where engineers will test the fit of the adapter June 26. (NASA/Langley)

NASA Celebrates Small Business Week June 17-21

By Jena Rowe

This week, each NASA center is honoring the contributions of small businesses to the economic well being of the United States following President Barack Obama's proclamation of National Small Business Week in 2013.

"America's Small Business Program is the economic engine in the U.S. economy that drives innovation and creates jobs for many Americans," said David Brock, small business specialist in the Office of Procurement at NASA's Marshall Space Flight Center.

"Based on 2010 census data, today there are more than 27 million small businesses employing more than 60 percent of the U.S. workforce while contributing to more than 50 percent of the U.S. Gross National Product. Small businesses also lead the way in innovation, with more than 50 percent of all new inventions being developed by small businesses. Since 1993, approximately 64 percent of all new private sector jobs were created by small businesses. If America is to remain a world leader in the global marketplace, small businesses will no doubt play a key role in our future successes."

In fiscal year 2012, small businesses received approximately $257 million in direct dollars, and approximately $300 million in subcontract dollars by Marshall large-business prime contractors.

President John F. Kennedy was the first president to sign the proclamation in 1963.

To learn more about Marshall's Small Business Program, visit here. To read the president's proclamation, visit here.

Rowe, an Analytical Services Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.

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deep-freezing science of cryogenics; learn about Mars and build small Martian rovers; construct miniature parachutes and Curiosity rover capsules to recreate the Mars Science Laboratory's descent over the Red Planet; and assemble straw rockets, NASA picture frames and other crafts. Marshall's Mobile Command Center -- a 40-foot-long emergency response vehicle -- and a Redstone Arsenal fire truck also will be on display outside the Activities Building.

Kids also can learn about conserving electricity, the importance of good finances and summertime water safety -- activities sponsored, respectively, by Huntsville Utilities, Redstone Federal Credit Union and the North Alabama Coast Guard Auxiliary.

Marshall teams participating in the event include volunteers from the Engineering Directorate, the Office of Academic Affairs, Marshall Protective Services, the NASA Global Hydrology and Climate Center and Robotics Academy students at the center. Other participants include The Boeing Company, Dynetics, Sci-Quest and the U.S. Space & Rocket Center, all in Huntsville.

The day's planned activities will conclude at the Activities Building with a big-screen showing of "Cloudy With a Chance of Meatballs" -- an animated film about scientific experimentation run amuck.

Visit the event page online for the latest event information, plus a complete roster of activities, start times and locations, centerwide shuttle bus schedule and Redstone Arsenal access guidelines.

For more information, contact Abbie Johnson at 256-544-0014 or abbie.j.johnson@nasa.gov.

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